Alloway (T. J.)

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BY

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Gynæcologist to the Montreal Dispensary.

*Reprinted from the "Canada Medical and Surgical Journal" for April and August*, 1886.

Montreal:
GAZETTE PRINTING COMPANY.
1886.

REPRINTED FROM THE "CANADA MEDICAL & SURGICAL JOURNAL."


# THE RELATION OF MICRO-ORGANISMS TO THE PUERPERA AND THE WAY TO MANAGE THEM.

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(*Read by title before the Canadian Medical Association, at Chatham, September*, 1885.)

In speaking of the relation which micro-organisms bear to the morbid conditions which the human puerpera is in danger of, it is exceedingly difficult to avoid being to a certain extent prolix. The vital importance of the subject becomes impressed upon us more and more as we continue to devote our thoughts to it, and as we become aware of deaths occurring in our midst frequently, which we have every reason to believe should be preventable. And it is this latter fact which is weightiest of all in urging us on to investigate and add new ways of conducting the puerperium towards attaining a low fractional mortality.

One of the great questions of the day is *how to obtain this low mortality*, and another—probably the more difficult of the two—is *how to make the growing-up members of the profession convinced of facts tending toward this end?*

Up to a period of the world's history approaching the middle of the present century, it was not an uncommon occurrence for men to have had allotted to them during their individual lives a number of wives varying from two to four. And we are told that the wives of these men for the most part died in childbed or from "some obscure internal disease" presumably connected with the organs of reproduction. On the other hand, it was well established that "old maids" never died. They became extinct as individuals through a process of gradual desiccation experi-

enced in no other phase of nature. And I hold that until we can reduce the mortality of "wives" down to that of "maids" we will be wanting in our duty as faithful and determined investigators. Let us turn our backs upon expectancy, redolent as it is with the tenets of dark ages. I say this in much earnestness, because infectious puerperal disease has still its friends at court who are constantly disclaiming against such a wolf. They will tell us in open council they have never, in many hundreds of cases, seen one of septic fever; that they do not believe in antiseptic precautions; that the lochia is a healthy-healing medium (*sic*), and should not be interfered with; that it is meddlesome midwifery, and that the female genitals form a temple only for the gods to behold. I have before me a copy of the *Medical Age* (April 25th, 1884), in which there is an article on "Common Sense in Obstetrics," by "An Old Practitioner." The author says, "I never could muster courage enough to subject a modest woman to the indignity of making an ocular examination for a rupture, and I have never found it necessary so to do, Dr. Thomas to the contrary notwithstanding." The whole of this article, from beginning to end, is a good sample of many such as we see in medical journals of the present time. They are simply harangues of vicious invective against modern advance in gynæcic medicine, and are directed particularly against such men as Gaillard Thomas and his followers in antiseptics. They truly remind one of Bacon's definition of Fame—"*A gilded butt to be pierced by arrows of malignancy.*"

If these gentlemen of the pre-liberal age would only consider that there are many circumstances connected with their individual careers which would *seem* to justify them in leaving everything to nature, and that there are possibly circumstances connected with the lives of others not similarly situated which a like procedure would be most fatal to their patients and their own reputation, medical editors would be spared the publishing of much matter which they cannot conscientiously endorse, and Thomas, in his endeavor to save life and benefit our race, would not sometimes feel with chagrin that he had been throwing pearls to "inappreciative mortals."

Between the years 1847 and 1880 no less than 164,446 deaths have been registered in England as the result of septic puerperal disease. This number does not represent the true facts of the case, as there must have been many such deaths not registered under this term. It has been said by physicians who lived at the beginning of the present century that they would as soon be called to attend a case of hydrophobia as one of puerperal fever. And, more recently, Dr. Stokes assured the Dublin Obstetric Society that in his experience of over forty years he had never seen a single instance of recovery from puerperal fever.

Fischel tells us that at Breisky's second clinic at Prague during the three years from 1879 to 1882 the mortality varied from 3.1 to .0 per cent. under various forms of prophylactic precautions. And Fischel concludes that the prevention and treatment of septic puerperal affections must be *local* and *surgical* in character.

Paul Bar, in his late work, tells us that prior to the year 1870 the percentage of deaths varied between 3.5 and 20.3 per cent., the rates being nearer the latter figure. After 1870, when Tarnier began to practice and teach antiseptics, the mortality began to decrease from 2.8 in 1871 to 1.1 in 1883. In Tarnier's pavilion, established in 1876, there was but one death in 88 cases. In 1877 and 1878, out of 204 and 237 deliveries respectively, only two deaths; in 1879, out of 189 deliveries, only one death; and since then up to middle of June, 1883, out of a total number of 785 deliveries *not a single death.*

In the year 1875, Battlehner of Karlsruhe reports 530 puerperal deaths from all causes in the Grand Duchy of Baden. After the introduction of antiseptic prophylaxis, the mortality sank in 1880 to 450; in 1881 to 380; in 1882 to 225; and in an average of 56,000 parturitions, from 0.95 per cent. to 0.4 per cent., or more than one-half.

In Dr. Macan's report of the Rotunda Hospital for 1883 there appears a most remarkably low mortality under strict antiseptic precautions. The pupils and nurses are required to wash their hands thoroughly in a solution of carbolic acid and then dip them

in a solution of corrosive sublimate (1 to 1,000) before making a vaginal examination. The vagina is irrigated with an antiseptic solution before any post-partum operation is performed, and the uterus is irrigated afterwards with a solution of corrosive sublimate (1 to 2,000). The report states that under this practice, of 1,090 women confined during the year, 6 died, a mortality of 0.55 per cent. And the most noticeable fact is that *none* of these deaths were from septicæmia.

During the discussion on puerperal fever at the New York Academy of Medicine (1884), very startling facts were brought out by Dr. H. T. Hanks. He stated that he had obtained statistics from the Board of Health of New York City showing that during the past four years, out of 120,418 puerperal women, 1,005 deaths occurred from puerperal fever, or 1 death in 120 cases. And he expressed the opinion that, under such a state of things, the profession should be ready to accept any judicious change in the care of the puerpera which would promise better results for the future.

From these few statistical quotations, it will be seen that the mortality in childbed-fever has been gradually decreasing of late years ; and as there must be a substantial cause for this improvement, it is fairly attributed to the gradually increased shedding of light upon the pathology of the puerperal state. From this it became evident that child-bed fever, in its fatal forms, was due to bacterial agency, and that a traumatic infective disease was the imprint of its nature. It is true that there are eminent writers, as Mundé and some others, who maintain that *all* forms of puerperal fever are not septic in nature. What this other form or forms are, is not stated ; nor are we led to understand that such forms of the disease have received any reasonable proof which would militate against the fact that they are septic all the same. When a rise of temperature occurs during engorgement of the mammary glands, accompanied with some headache and increase of pulse, and controlled by a little aconite and a purgative, the condition should not be spoken of as " puerperal fever," although its identity with blood infection is more than probable. I will but refer here, in a passing way, to the fruit-

less endeavors of the unhappy Semmelweiss to turn the stubborn heads of his colleagues on this point. The history of the subject in this respect is familiar to all. To Semmelweiss, the obstetrician, is due the credit of having first shown that patients dead of surgical blood-poisoning, died with the same symptoms as patients dead of puerperal fever, and that the post-mortem examination yielded similar morbid conditions in each. His strong conviction of the truth of these facts led him to adopt antiseptic measures with the well-known wonderful results. Some twenty years ago it was established by Rindfleisch, Birch-Hirschfeld and others that wounds, on becoming unhealthy, contained numbers of spherical bacteria, and that the unhealthiness thereof stood in direct relation to the number of these bacteria. The more abundant these appeared, the worse became the state of the wound and the general condition of the patient. The blood of patients dead of puerperal fever was examined and found to contain bacteria in large numbers. In some of these cases it was also noted that small metastatic deposits occurred in the organs and tissues generally, and that these deposits were largely composed of minute organisms. These were cases of true pyæmia, and in no way differed from those dead of that disease under the care of the surgeon. In these pyæmic deposits bacteria generally appear in colonies or zooglæa. The channel by which these passed from the original source to form metastatic foci was shown by Klebs to be through the interspaces of the cellular tissues, and that this takes place either with or without the aid of wandering lymph corpuscles. They also travelled by means of emboli from thrombi situated in veins. Often in this manner septic organisms will pass along the blood-current unharmed as regards their vitality and power of settling in some distant organ or organs which have suffered injury sufficient to weaken their power of bacterial resistance. We know that micro-organisms cannot live in healthy living blood. They may enter it by escaping from the original wound-infection seat, but so long as the vitality of the blood is high, and there is no diminished resistance, these organisms become enfeebled and ultimately die outright. If, however, on the other hand, the vitality of the individual is of a low grade,

and the resistance to bacterial life is diminished, these organisms will gradually accumulate in the blood and tissues. They will increase rapidly now, where they found no footing before, and the more prosperous and luxurious they became, the more will the failing vital powers of the patient become evident. The organisms will continue to multiply and form small groups that increase in size until they are too large to pass through the capillary network. In this way they are caught and detained in the lungs, liver and other parts; and, still continuing to grow, form duplicates of the original wound-infection and supply the blood with their ptomäine poison. These metastatic foci of infection find the soil in which they become located suitable for their continued existence and growth, and form a stage of the disease known by the term *pyæmia*.

Micro-organisms, however, do not always act in this way. We know that much depends upon the dose, virulence of the organism, susceptibility of the patient, structure of the organ invaded, and other circumstances. Koch has experimentally proved that a very large dose of putrid blood will cause rapid death, with symptoms like those accompanying death from a narcotic poison. In these cases no organism whatever is found in the blood, and very little alteration of tissues is found at the seat of injection. The animal, in fact, dies from the effects of an overdose of a chemical poison before the infected micro-organisms had time to enter the blood in any appreciable numbers. Moreover, the blood from this animal so killed did not have any effect whatever on another animal when injected under its skin. Here we have a profound poisoning by ptomäines generated by the micro-organisms injected, and the animal dies showing no post-mortem evidence of secondary metastatic deposits. If, however, a smaller quantity of putrid blood be injected, the animal, say a mouse, shows much less marked symptoms of poisoning, and, in fact, they are quite absent when a very small quantity is used. If, from those animals, however, which die after this small dose, a small quantity of blood or subcutaneous fluid from seat of inoculation be taken and injected into another animal, it will die of precisely the same symptoms. This can be continued through

a series of any number of like animals, with the same results. The post-mortem examination of these animals shows the blood to contain large numbers of very small bacilli. Koch, Davaine and others called this disease *septicæmia.*

By this statement it is not meant that because the mice septicæmia of Koch is due to the presence in the blood of very minute *bacilli*, that these are also present in the blood of human beings dead of that disease. In fact, the contrary will be found to exist, in so far that bacilli are not by any means the predominating bacteria in man septicæmia, but that micrococci are the pathogenic organisms here, as in the septicæmia of rabbits. The question now comes before us—In what relation stand micro-organisms to the septic process going on in the infected animal? Is the damage caused by their mechanical irritation, or by the irritation and lethal effect of a material generated by their reproduction and growth? Bearing upon this point, I remember seeing, in consultation, a young woman, in the hot summer weather of 1883, at the village of St. Henri. I found her lying upon her back in an insensible condition. Narcosis was as profound as if she was under chloroform. Temperature 105°; pulse 130. Her special senses were obliterated. She could not be aroused. The stench of putrefying blood was simply horrible. The windows were thrown open, and she was ordered to be sponged with a carbolic solution until clean, and then removed to another room for examination. During this operation I obtained the history from her medical attendant as follows: She was confined three weeks previous to my visit. On the tenth day she left the house and walked to the next street corner and back. She shortly afterwards felt considerable pain in the pelvis and abdomen, which was followed by a very profuse discharge of blood. The pain ceased in a few days, but the discharge continued free, and was not allowed to be interfered with lest the patient should *catch cold.* The result was that days of accumulated blood under the patient was allowed to remain and decompose, and form a beautiful culture medium for the various micro-organism deposited there. These followed the vaginal canal to the cervix, which was extensively lacerated, and thence upwards

to the still unrepaired placental site. Here we had a terrible state of things. I found the whole pelvic cellular tissue set in one mass of inflammatory exudate. And it occurred to me that here in this human subject was a case which bore a strange relationship to Koch's experiments with chain-like micrococci upon the field mouse. The lacerated cervix and unhealed placental site were inoculated with decomposing blood containing masses of micrococci. They invaded the blood and lymphatic vessels of the parts, generated ptomäines, which set up an extensive phlegmon of the whole cellular tissue of the pelvis. Constant absorption of this poison was being carried on until the nervous centres became so saturated, and their function interfered with to such a degree, that impending death became apparent. The only existing difference between the case of this woman and that of Koch's field-mouse was, that in the woman's case the influence of the organism was not sufficiently powerful to utterly destroy the cellular elements of the tissues invaded; in the case of the mouse it was, and gangrene ensued. The organisms had, however, the effect of forming a barrier to further extension of the disease beyond the pelvic tissue. And although these micro-organisms exert so baneful an effect upon animal life when they get a footing in injured tissues of a fitting soil, they also form a limiting barrier to the spreading of inflammatory and suppurative disease, which would otherwise become general and rapidly fatal. In the case just related we had the inflammation set up by ptomaines generated by the micrococci in the decomposing blood. The organisms, in their turn, walled in the field of inflammation; but absorption of septic poison into the general circulation was being rapidly pushed on to almost complete extinction of the vital powers. This woman underwent treatment of which I shall speak further on, and recovered. And I firmly believe if Koch's animals had been experimentally treated on similar principles shortly after their inoculation, death would not in these cases have ensued.

In regard, then, to the *rôle* which micro-organisms play in the septic phenomena, it would appear that they stand as the first link in the chain of causation—in fact, it would be more correct

to say that that chain had but one link, and that the phenomena arising therefrom were but expressions of malign influences coming from this focus. Take away this focus and the septic phenomena cease to exist. Ogston has pointed out to us that there is no such condition as septicæmia or pyæmia *per se*. *We must have a traumatism*, whether that be in the form of an inflamed wound or an inflammation of seeming spontaneity, it matters little. And it has always appeared to me that, next to the mangled parts in a bad railway accident, there can be no more fitting traumatism as a culture-ground for micro-organisms than the mutilated passages of the puerpera.

Let us now take, in illustration, a puerperal patient with the usual wounds in her parturient passages, and that it is understood that there is a possibility of her becoming a subject of infective disease; that her wounds are the same as other traumatisms, and liable to the same dangers. *What, now, are the conditions leading to the infection of the wounds in question? What are the most rational means, according to our present knowledge of these dangers, to be adopted in prophylaxis?* It is universally acknowledged that certain septic and pathogenic micro-organisms surround our patient, and, if left undisturbed, are capable of setting up putrefactive changes in wounds exposed to their influence. It is also well known that when albuminous fluids, such as blood, meat infusion, and such like products, are exposed to the air for a certain time they become putrid, and that on microscopic examination they are found to contain every variety of micro-organism. That amongst the legion of different species of micrococci and bacilli occurring in these fluids, the great majority of them are quite harmless. When they are introduced into the body of a healthy animal they are unable to grow or multiply, and therefore are unable to produce any disturbance whatsoever. But some few species there are which, although growing and thriving in ordinary putrid substances, possess the power, when introduced into the body of a suitable animal, to set up a specific disease. Our best examples are the bacillus of anthrax, the micrococcus of erysipelas (so much studied in this respect by Fehleison), the tubercle bacillus of Koch, also

the bacillus of swine plague. Davaine's septicæmia of rabbits. Koch's septicæmia of mice, and so on, cannot be produced by every putrid blood or putrid organic fluid, only by some, only now and then—*i.e.*, when the particular micro-organism capable of inducing the disease is present in those substances, and then only when it finds access to a suitable animal. Davaine's septicæmia of rabbits and Koch's of mice cannot be induced in guineapigs. Anthrax cannot be induced in dogs, and so on with other pathogenic organisms. These pathogenic or specific organisms have the power of growing and thriving in the animal tissues *ab initio*. Those which do not possess this power—the non-pathogenic—cannot acquire it by any means whatever. Many are familiar with Koch's and Klein's criticisms of Buchner's experiments in endeavoring to prove the change of the non-pathogenic hay bacillus into the pathogenic anthrax bacillus, and how Buchner's error occurred through accidental air contamination. That Klein proved it was as impossible as to convert the bulb of the harmless onion into the bulb of the poisonous colchicum. There is also instanced the case of the so-called jequirity bacillus, as proving the conversion of a common septic into a pathogenic organism. This was proved to be more absurd than the hay and anthrax bacillus story, as it was shewn that the morbid condition set up in the eye by the introduction of an infusion of jequirity bean was due to the fact that in this infusion certain active principles existed, closely allied in nature to albumen, in which the common septic organisms in the surrounding air formed a special nurture medium to grow and multiply in. It is, however, with the common septic organism we have to do chiefly in connection with the febrile condition met with in the puerpera; and it is to these I will draw attention.

Many observers have shown that by putrefaction of animal substances a substance can be obtained—sepsin—which can be isolated by a chemical process destructive of every living organism, and which, on injection into the vascular system of animals in sufficient quantities, produce marked febrile rise of temperature, and is capable of causing death with the symptoms of acute poisoning. Lister has shown that under careful antiseptic dress-

ing of wounds, putrid intoxication, as well as septicæmic infection, does not at all occur. From experiments of this nature on lower animals, we can easily find analogy in those rapidly fatal cases of intense septicæmia occurring occasionally in the much-neglected puerpera, and in some cases of death after abdominal section. These septic organisms differ from pathogenic organisms in some important respects. They require for their support and thrift much less complex substances to live in—almost any animal or vegetable fluid. They also differ from pathogenic organisms in the very essential respect that they absolutely refuse to grow in the *living tissues of the living animal*. During the life of the patient should any part, such as the parturient tract, become necrotic from severe injury, or so severely changed, by inflammation or otherwise, that the part involved becomes practically dead, then that part becomes packed with masses of micrococci, and here these organisms find a suitable nidus for growth and multiplication. They may, in extreme cases, also be found in other organs distant from the original seat of injury, but it will be found that death has been so rapidly approaching, and the general disorder has been so severe, that these tissues have begun to lose their vitality, and therefore their power of resistance to the invasion of these septic organisms. The question may now be asked—Where do these organisms come from which are thus capable of settling in remote tissue even during the ebbing life of the patient? In the case of the intestinal wall and abdominal organs generally, there can be little doubt but that they immigrate from the cavity of the bowel, where they are normally present; nor do I think there can be a doubt in the case of a secondary pneumonia or inflammation of serous membranes during a neglected case of septic metritis. It is not difficult to understand that when products which form a nidus for these organisms become taken up by the general circulation, they act as emboli, and thus set up secondary inflammations in distant organs. These organisms, although unable to travel through the living blood unprotected, can, under the protection and cover of these emboli, be carried carefully to distant regions and there deposited, retaining their full vigor and vitality. But

when found in these organs, it does not follow that they orignated there, but are simply the result of transportation from parts which have direct access to the outer world. We have this fact exemplified in the puerpera ; the lochial discharge is charged with micrococci from the very first day after delivery. This fact I have demonstrated many times myself by examining the lochia microscopically at various periods during the puerperium, and have never failed to find the specimen well filled with micrococci. These organisms must, to some extent, find their way into the blood, but being unable to resist the living healthy blood they die at once and are no more heard of. But let these very organisms reach, under protection, an organ in which the balance between health and disease has been disturbed by excessive functional activity or otherwise, and the result will be different. It has been pointed out by Ogston that acute suppurative mastitis occurring in neglected puerperal patients was due to immigration of micrococci, and that the reason they settle in the breasts was on account of those organs being in a state of high functional activity approaching congestion. This I have noticed myself, and it has been evidenced to me by the fact that I have never seen an acute suppurative mastitis since I began the practice of proper vaginal irrigation ; whereas prior to this, mammary abscess was by no means an uncommon occurrence. As an off set to these teachings, it may be said that the healthy blood has been found to contain minute organisms normally, and that under conditions they can be deposited in certain organs to set up mischief. This theory has now been admitted to be utterly unfounded, and it has been distinctly proved that the living blood contains no organisms whatever ; and that the error in this respect arose from accidental contamination. As we have now seen somewhat of the relation of micro-organisms to the puerpera, we will turn our attention to the means of managing them.

The part of the post-partum treatment of these patients which treats of the prevention of septic phenomena is found in the history of antiseptics generally as applied to general surgery. Our endeavor should be to inhibit the function of germs, and in this way obtain a total extinction of the disease in question. To say

that we possess, according to our present knowledge, germicides applicable to such cases is untrue.* Antiseptic measures we can institute and carry out. Germs we will have settling in and infesting parturient wounds, no matter under what circumstances or how careful we are in endeavoring to exclude them. Ogston proved that nine hours after delivery the lochial discharge contained putrefactive organisms in abundance. This fact I have proved to my own satisfaction in *every* case, the discharges of which I have examined. It only requires the necessary time for these organisms, present from the beginning, to bring about definite vital phenomena, characterized by the change of proteids into soluble peptones, and these into leucin and tyrosin: these, in their turn, into very low compounds, which ultimately yield certain alkaloids having toxic effects when absorbed into the blood. And it is interesting to know that these very changes are brought about by *abstraction* of materials which are necessary for the growth and multiplication of these organisms. We constantly hear of the all-soothing and healing properties of this perfectly harmless fluid, which nature in her great wisdom gave woman as a sort of Balm of Gilead in their function of race-production: that it is, we are told, a crime to wash it away or interfere with it in any way whatsoever; that such a course of treatment is in direct contravention of the laws of nature, and that woman in her wild state requires no such refinement of treatment in labors. But it is here forgotten that woman in her wild state is not surrounded by the conditions, too numerous to mention, which her sister of the unhealthy and crowded city is, and that it is not true that they are altogether exempt from puerperal fever. Dr. Engelmann has long since proved this, and I myself have been informed by a trustworthy missionary's wife, many years a resident with the Oka Indians of Canada, that the septic micrococcus runs a high and mighty career amongst the lying-in squaws of that settlement, occasionally sweeping many of them away in the form of an epidemic. As regard the harmlessness of the so-called healthy lochial fluid when at rest in the passages

* *Vide* Klein, Micro-organisms and Disease, page 188. Cheyne, Antiseptic Treatment of Wounds, page 25.

in contact with necrosed tissue, from what we have learned we can only regard it as a veritable culture fluid of a fairly complex nature ; that the passages in which this fluid rests form an excellent incubator, and that the necessary physical properties for the incubation and growth of bacterial life—heat, moisture and rest—are all here and constant. To me there is but one conclusion to be arrived at—namely, that we must break up these conditions, and by changing that of *rest* into one of motion or running stream, we render the resident organisms harmless. Upon this principal is based the whole value of the so-called antiseptic irrigation, and in my experience it matters very little, in uncomplicated cases, whether we use as a prophylactic powerful antiseptics or boiled water. And that it is not necessary to use irrigation to flush the bacterial stream more often than once every twenty-four hours in simple cases, and every twelve hours in more serious cases. The reason for this is obvious. The organisms cannot make a start at growth in their incubator under several hours of undisturbed existence, and consequently no poison is generated in sufficient quantity to produce a general systemic effect.

For the past five years I have most strictly followed out the plan of antiseptic irrigation in *every case of parturition*. I have obtained, as is well known, the most gratifying results to my patients and comfort to myself. I have also had some amusement in carrying out the treatment in the presence of those women who have nursed patients for a quarter of a century, and felt quite disturbed at innovations of this kind.

I remember attending a young married lady in her first confinement. About the sixth or seventh day she said to me, " Doctor, when I left home my mother told me, if I should ever be ill in this way, not to be alarmed if on the third day I would feel very sick, have a bad headache, and feel feverish ; it would be the ' Weid,' and quite natural."

I remember a case which bears somewhat upon *septic* midwifery, which was interesting to me at the time. The patient was about 30 years of age, in her third confinement. I ordered an irrigator as usual, but through some neglect on the part of

the nurse (I think intentional), it was always being forgotten. On the morning of the fourth day I was sent for hurriedly. I found this patient suffering from intense headache, high temperature, and some pain in the pelvis. On close examination, I found a small laceration, just within the posterior commissure of the vulva, granulating. My finger went directly downwards into a pouch full of very fœtid discharge. The infective material in this case may possibly have been absorbed from the vulvar tear. It might also have been taken up by the slightly lacerated cervix. Here was a case where the vagina was converted into a most excellent incubator, and it only wanted the necessary time for the organisms of putrefaction present to establish the chemical changes before alluded to.

Another case of an interesting nature was a young married lady in her first confinement. The husband had confided to me the fact that he was suffering from an attack of gonorrhœa, and that he felt sure he had conveyed the disease to his wife. I used all precautions before the confinement. After the birth, the irrigator was used twice daily up to the tenth day, and thinking all was right, as far as the probability of specific infection was concerned, I omitted it from this date. All went well until the fifteenth day, when she was seized with violent chills, high fever, intense headache, and severe pain in pelvic region. Uterus was irrigated morning and evening with sublimate solution, etc. On the twentieth day the symptoms abated. Here was a case where the specific gonorrhœal poison was being washed away, and the action of the micro-organisms inhibited for ten days. The discharge was then left with the coccus; it began to develop, and produced the poison in sufficient quantity and virulence to induce, in four days, a violent toxæmia.

About a year ago I was asked to see in consultation a young French primipara, who had been confined some six or seven days previously. I found her intensely septicæmic. The air of the room was very fœtid, discharge extremely so, and matters generally in a bad state. I noticed, also, that the husband of this patient had his hand in a sling, as if wounded. On nearing him I got a distinct odor of iodoform. The physician in charge

said this man had sustained a severe injury requiring amputation of two of his fingers; that he had dressed the wounds antiseptically, and that the injured parts were nearly well. This was an excellent illustration of the strange views held in regard to the treatment of puerperal wounds. If a man gets his fingers injured, the wounds are carefully washed from all foreign particles, edges nicely brought together with sutures and iodoform and other antiseptic dressings carefully applied. The wounds are re-dressed every day or so until recovery takes place. When, however, an unfortunate young wife suffers much more severe injury to her genital tract, the student is told on no account to touch those parts, they are sacred, nature will do everything; should she fail, however, he is told to do *then* what he should have done at the outset under the principles of *prophylaxis*. In fact, to pursue the very course the well-cultured surgeon had taught him in the case of the injured husband. I cannot refrain here from commenting upon the inconsistency of these expectant physicians. They recommend for the *cure* of the disease that which they strongly denounced for its *prevention*.

We will now pass on to the subject of antiseptics, and I will only consider those which are applicable to the cases we have under consideration. In using the terms *antiseptic* and *germicide* we must be definite and clear upon the correctness of their application. As used at present in current literature, their signification is somewhat misapplied. Their application would lead us to suppose that in them we had substances which would kill *outright* bacteric organisms, and that we need no longer fear germinal activity on the part of these organisms. To be brief, we have no such substance. Klein has shown us some very interesting experimental results. By exposing micro-organisms in nourishing media at proper temperatures, and adding carbolic acid or corrosive sublimate in very strong solution, he found that their growth was retarded or altogether inhibited, but on removing these organisms, and placing them in fresh nourishing media, they grew and multiplied as if nothing had happened to them. And, further, if the spores of anthrax, treated in this way, are

inoculated into guineapigs, the animals die of typical anthrax. But be it understood that, although the spores of the bacilli remain unaffected by such powerful agents, the bacilli are killed, this being the cause in all probability of the inhibition of their vital functions while in the antiseptic medium. Of all the antiseptics with which Koch experimented, he found the bichloride of mercury the most effectual: 1 in 600,000 parts is capable of impeding, and 1 in 300,000 of completely checking the germination of spores. These spores can withstand, *uninjured*, the effects of boiling water for a few minutes; it, however, destroys them outright in a short time. Let us now consider in detail the characteristics of a few of the favored so-called antiseptics, or, more properly speaking, micro-bacterial inhibitors, and the technique of their application.

*Carbolic Acid.*—Notwithstanding that carbolic acid has its advocates, and that the most respected of surgeons, Dr. James B. Hunter of New York, declares it to be superior, or equal, to the mercuric perchloride, I think the majority of surgeons have not found it by any means satisfactory. As a proof of this, we find them using carbolic acid wherever instruments are in danger of being injured by the bichloride, but directly the instruments are no longer required, the carbolic acid is put aside and the bichloride substituted. I have found that carbolic acid solution in obstetric cases requires frequent repetition of application to obtain that action which insures safety. If we use five per cent. solution frequently, it is likely to abrade the tissues, and that in very weak solutions it has no material effect whatever over boiled water. On account of the necessity for its frequent repetition, it is doubtful whether the unavoidable disturbance of the patient does not counterbalance in injury the good intended to be obtained by its use. Also, it is left in care of nurses, which has many times resulted in very disastrous consequences. I have therefore given up its use entirely in obstetric cases for some years past.

*Iodoform.*—Is not generally used as a prophylactic in obstetric cases. It does not, in small quantities, seem to have a very powerful effect in inhibiting the vital phenomena of micro-organ-

isms. I have seen them, notably the bacterium termo, quite active in a well-impregnated solution of beef on the third day, the odor of the iodoform, however, covering up that of putrid decomposition. Binz found that iodoform retarded the migration of leucocytes through the vessel walls. Its odor is peculiar, and has made it in the majority of cases objectionable to the lying-in patient. As a slight digression from the subject I might say here that I have used iodoform in the form of suppositories in cases of puerperal metritis. These suppositories (gr. x each combined with boric acid) are introduced into the enlarged and œdematous uterus after each irrigation night and morning, and the cavity was in this way rendered aseptic until the affection had subsided. Its undoubted service in these cases is now, I may say, universally acknowledged, and to such I think its application in obstetrics will be limited.

*Boracic Acid* is a good antiseptic in obstetric cases after the sublimate solution has been discontinued. It is non-poisonous and non-irritating. A large teaspoonful of the powder dissolved in a quart of hot water can be used as an irrigation once or twice daily, beginning on the eighth or tenth day and continued for a period of two or three weeks. It removes any purulent discharge which may have collected in the vagina at this period of convalescence, and aids involution of the vaginal walls and cervical glands, the latter of which are so enormously enlarged during pregnancy. Boracic acid is also a much better antiseptic than it usually gets credit for. I have at present a beef infusion treated to saturation with boracic acid one month ago, and it is still perfectly sweet and free from micro-organisms.

*Naphthalin* is not suitable for obstetric purposes, chiefly on account of its insolubility in water. Placed in beef infusion, it does not prevent the development of micro-organisms and putrefaction taking place longer than eight days.

*Eucalyptus Oil* is a very good antiseptic. Bucholtz found it to be three times as powerful as carbolic acid in this respect.

*Bichloride of Mercury* is the most recent and effectual inhibitor of bacterial growth. A solution of this salt so dilute as 1 in 300,000 will render the spores absolutely incapable of ger-

minating, and will, of course, kill the organisms outright. This result is, however, not confined to mercuric solutions, as the presence of carbolic acid, phenol, thymol, salicylic acid, and even weak vinegar, if in sufficient quantity, will prevent the spores germinating in any nourishing medium. But apart from this, it is believed that the bichloride solutions has a specific action on the injured and swollen tissues which no other so-called antiseptic has in the same degree. I have seen most extensive swelling of the walls of the vagina and vulva resulting from prolonged forceps operations disappear, under irrigation night and morning of a very hot bichloride solution, in 36 hours. Pain and tenderness also disappear, leaving no further necessity for the use of the catheter. In just such cases I have experienced disappointment during the use of carbolic acid, Condy's fluid, and such like solutions, in being compelled to resort to the use of the catheter for several days. Regarding this antiphlogistic property of the bichloride, it is somewhat difficult to give a definite opinion upon. Ogston however, has shown that acute inflammation may be produced by micro-organisms. If corrosive sublimate is here capable of destroying more effectually than any other agent these resident micro-organisms, we can understand this certainly very valuable clinical fact. It is not due to astringency, as no other mineral astringent will act in the same prompt way. A very remarkable relation obtains between vaginal irrigation with the bichloride solution and the non-occurrence of acute suppurative mastitis. Ogston has drawn our attention to the occurrrence of mammary abscess at a puerperal period, which coincides with the lowered vitality observed in unduly stimulated and congested mammæ and fœtid poisonous lochia. That cocci obtain an entrance into the circulation in some protected condition, and though powerless to effect a lodgment in stronger organs, they become welcome guests and colonize in the weakened and congested breasts. Be this as it may, I have not seen, in a single instance, a mammary abscess occur in practice since I began the mercuric irrigation; and it was certainly not an uncommon occurrence to me when treating these cases upon the expectant plan.

Kuestner (Jena) found that after carbolic irrigations of the uterus, the prompt disappearance of the cocci could *not* be demonstrated, but they vanished very promptly after the sublimate irrigation.

Frænkel (Breslau) found that during very extensive experimental investigation with all known germicides, the cocci disappeared from the uterine secretions most rapidly under the sublimate treatment.

Hegar (Freiburg) uses the sublimate irrigation, and has found it the most satisfactory of all germicides at the Freiburg Clinic.

Kehrer (Heidelberg) believes that in the puerperium the sublimate is indispensable. Only one-third of all parturients under his care with the sublimate solution showed any signs of fever, while before its introduction two-thirds of cases exhibited severe fever.

Paul Bar's remarkable statistics of mortality in the Paris Maternities before and after the introduction of antiseptics is simply marvellous. In fact, they speak so emphatically in favor of antiseptics that even the most obdurate of expectantists will not in future have a leg to stand on.

Auvard (Paris), speaking of corrosive sublimate says: "It is still the antiseptic to which preference is accorded in the various obstetrical services of Paris. Its trifling cost, its powerful and certain action, and its almost entire harmlessness, gives it supremacy over all other antiseptics in use at present."

At a recent meeting of the Obstetrical Society of London, Dr. Mathews Duncan said that the subject of antiseptics was the greatest in the obstetric department, but it received very little attention. It was more important than the prevention of epidemics, for they only came occasionally, while puerperal deaths continually occurred. In the history of the subject, he said all measures had failed to reduce mortality until antiseptics were introduced. Dr. John Williams said: Taking the deaths in childbed at one per cent., the lowest mortality after the destruction of puerperal fever would be a quarter of one per cent. The object should be to reduce the mortality to this level, and

he believed it might be attained by antiseptics. He and Dr. Champneys had used in the General Lying-in Hospital in succession carbolic acid, Condy's fluid, and corrosive sublimate as antiseptic agents. Since the last named had been employed there had been *no deaths* from puerperal fever, and scarcely any illness.

Closely connected with this subject is Dr. Max Schede's contribution to the literature of antiseptics in surgery and obstetrics generally. (*Volkmann's Klinische Vortrage*, No. 251.) Previous to the time of Listerism by Schede's predecessor, the number of septic accidents and cases of erysipelas was very large. Under Listerism a marked improvement took place, but it did not accomplish enough to satisfy the new director. He first began a systematic attempt to organize a surgical service, and to teach all the attendants the need of absolute cleanliness and asepsis. Coming to Hamburg at the time of the iodoform era in surgery, Schede at once introduced the iodoform treatment in all its details, but he was much disappointed in its results. Although he had some brilliant successes, the iodoform treatment often failed to prevent septic complications, while erysipelas increased in the wards very rapidly. Schede does not say that iodoform causes erysipelas, but he is decidedly of opinion that it does not prevent it. The iodoform was therefore abandoned as a failure, and the corrosive sublimate was introduced in its stead. The results obtained, during now three years, have been most brilliant and satisfactory, and Schede comes forward as an enthusiastic advocate of the sublimate treatment of wounds. The technique of his method is briefly as follows: He has two sublimate solutions, one of the strength of 1–1000 and the other 1–5000. The first is used to disinfect hands, skin of patient, sponges, drainage-tubes, and all wounds which are to be closed (in obstetrics, lacerated perineum). The second is used for irrigating large wounds. The materials used for dressing are sand, glass wool, sublimate gauze, sublimate wadding, and sublimate catgut. Sublimate wadding and gauze are prepared by soaking in a solution of the strength of 1–190, with 10 parts of glycerine. They are wrung out and allowed

to dry. The glass wool, of which Schede speaks in the highest terms, is prepared by soaking it in a one per cent. solution of sublimate. Wounds are covered with this prepared glass-wool, then with similarly prepared peat pads, and firmly compressed with gauze bandages. Schede thus concludes: 1st, The sublimate solutions are more efficacious and less dangerous than five per cent. carbolic acid solutions. 2nd, In severe wound infection, diphtheria, and gangrene, the sublimate solution can be used as strong as one per cent. with perfect safety.

Schede also discusses the dangers from sublimate absorption. He refers to the report of Fränkel, who found diphtheritic entero-colitis post-mortem in a number of cases, and attributed it to the mercury. To offset this, Schede reports four cases in which the same lesions were found after death, but in which the sublimate had not been used at all. He concludes that the diarrhœa and enteritis may be caused by sepsis. His cases certainly take away some of the force of Frankel's observations. He believes that with proper precautions the sublimate wound treatment is safer than any other.

In connection with the subject of the dangers of sublimate solutions in obstetric practice, it may be stated that Auvard, in *l'Union Medicale*, refers to two fatal cases from the intra-uterine use of sublimate solution. Hofmeier also refers to two cases of sublimate poisoning, one of which was fatal; and similar cases have been reported by Stadfeldt and Winter (*N. Y. Med. Rec.*, March 14th, 1885, pp. 291-2). One of the conclusions drawn by Auvard is, that the condition of the kidneys is a most important one to bear in mind, as a nephritis renders the patient more susceptible to the toxic effects of mercury.

It would be a very easy matter to continue producing clinical evidence of the value of the bichloride in the prophylactic treatment of the puerpera, but, at the same time, we must also look to what is said of it on the dark side. It is well known to be a powerful poison—first, in its therapeutic use as a lotion, and second, in its accidental administration by the mouth. It has, however, been evident to me that its ill effects, when used in no matter what way, have been brought about through want of care

and the proper knowledge of the *technique* in its application. When these have been carefully observed I cannot but look upon the drug as a perfectly safe one, and from a varied experience in its use, I think I always shall. For instance, it is very horrifying to read of Stadtfeldt's case, where some one had injected a post-partum uterus with a bichloridic solution (1-1500) four hundred cubic centimetres in quantity. Suddenly, collapse set in, followed by diarrhœa, bloody stools and death in ten days. An instructive accident of this nature occurred to myself when giving a vaginal injection several days after an accouchement. The tube, an ordinary glass one, attached to a fountain irrigator, passed up through a large patulous cervix into the uterus. She complained of the fluid passing higher than usual into the abdomen, and before I could recognize what had occurred, she turned pale and passed into a very violent rigor and state of collapse. I withdrew the tube and rapidly passed two fingers into the uterus, and with the aid of my right hand over the uterus outside, allowed the fluid, to the quantity of over half a pint, to gush out into the vagina between my fingers. I satisfied myself that the uterus was completely emptied, and then gave her a hypodermic injection of ergot. This patient was a little restless the following night from disturbance of her circulation, but was quite well next morning, and continued to be so afterwards as if nothing had happened. The collapse here was simply shock produced by sudden over-distension of the uterus by a fluid, and had I allowed that fluid to have remained there, which, without interference it certainly would have done, I would have had a subject for an essay upon the death-dealing effects of the sublimate solution in obstetric practice. This accident was, of course, due to unpardonable careless on my part, and does not bear upon the general merits of the principal.

The moral this lesson teaches is: Do not inject, even *intentionally*, a uterus with a tube which does not provide for a rapid return of the stream. An interesting paper on this subject will be found in the *Obstetric Gazette*, August 1884, page 413, by Dr. Palmer, urging the propriety of vaginal injections, used with

care, in every puerpera. An essay of this nature would not be complete without alluding to Dr. Garrigues' well known method of treating puerperal cases. It is briefly as follows:—

The patient is at first given a bath, then an enema. Her abdomen, genitals, buttocks and thighs are carefully washed with a warm solution of the bichloride, 1–2000. The vagina is then irrigated by means of a fountain irrigator with the same solution, two quarts in quantity being used. In protracted cases, this irrigation is repeated every three hours. At the beginning of labor the physicians and nurses wash their hands, using nail brushes, in a solution of the same strength before touching the patient. No lubricant is used in ordinary cases. If necessary, glycerine with bichloride solution 1–2000 strength. As the head appears it is received in a piece of lint saturated in same solution, and the genitals are kept covered with a similar compress. The placenta is expressed by Credé's method and the vagina is washed out with the bichloride solution. Intra-uterine injections are only used when the hand or instruments have been introduced into the interior of the uterus, or in case of birth of a macerated fœtus. Dr. Garrigues never allows any of the placenta or membranes to remain in the womb. With careful antisepsis the introduction of the hand into the uterus is in no way compared with the danger of hemorrhage and septicæmia by leaving any part of the secundines behind. In this case a large (two to six quarts) sublimate injection, intra-uterine, is given just as hot as the hand can bear it. After the expulsion of the placenta, the patient is washed and *the dressing applied.* It is (1) a piece of lint three inches wide, and double, saturated with the bichloride solution, (2) outside of that a piece of oiled muslin nine by four inches (3) outside of that a large pad of oakum, and (4) the whole is fastened by means of a piece of muslin to the binder, with pins, in front and behind. This dressing is put on with the same care as a wound is dressed after a capital operation, and renewed *four* times in the twenty-four hours. At each removal the genitals are washed. No vaginal injections are used unless the discharges become fœtid. (This dressing need not be so complicated. A good-sized solid pad of sublimate

jute made to fit well into the parts and secured to the binder in front and behind, makes a very effective antiseptic dressing.)

Dr. Garrigues has proved the bichloride to be much superior and more trustworthy than carbolic acid in such cases. His cases occurred in the University Hospital, New York, and it may have been not a difficult matter to carry out there under such able nursing. But even in Dr. G.'s hands, it has not prevented the lochia becoming offensive, which is evidence of putrefaction. And under such circumstances, I am strongly inclined to think that it was due more to the constant washing and changing of dressing that his patients did not become septic than to any particular virtue in this complicated dressing. I have given it a fair trial in private practice, and found that without irrigation the lochia invariably became fœtid just as without the dressing, and I therefore combine it with irrigation.

For several years I have, with the exception of one case related of septic fever, used vaginal irrigation of corrosive sublimate solution of strength varying from 1–2000 to 1–5000 once every morning at the usual visit. This was occasionally not begun until the second day after the delivery, and I think it is quite safe in private practice to begin irrigation at that time. I have also combined with the irrigation treatment that of applying after the injection a pad of antiseptic sublimated jute to the vulva and perineum, and pinning a strong napkin over this to the binder in front and behind. This pad is renewed night and morning only, and is chiefly intended to absorb discharge and support the perineum and pelvic floor generally. The patients have always expressed gratitude for the support experienced, and I am convinced of its benefit as a splint to the often much over-strained pelvic floor. This method has never allowed the discharge to become fœtid, as the vagina is flushed with a *very hot* irrigation of the sublimate solution every morning up to the eighth or tenth day, and then I generally advise the patient to have the nurse continue once every morning a very hot injection of a solution of boric acid with the view of aiding involution of the parts. This may be continued for any length of time up to a month. The benefit derived from this latter additional

advice to the patients will be seen in the properly involuted vaginal walls, and every physician knows what that means.

As regards our antepartum procedure, my views are essentially the same as those of Dr. Garrigues and other careful observers. It is most unpardonable in the conduct of a physician to examine his patient before he has washed his hands and arms to the elbows in at least an additional relay of fresh water, using nail-brush freely, and afterwards bathed them in a solution of corrosive sublimate. This solution, in a pint bowl, he should carry with him from the washstand to some convenient place near the bed-side, and before each examination dip his hand freely in the solution. Should it become necessary, during after events, to introduce his hand into the cavity of the uterus, it may be done so with safety.

In conclusion I would say:

1. Post-partum vaginal irrigation as described with weak solutions of corrosive sublimate, is nothing more nor less than antiseptic treatment of wounds; and the surgeon who practises the latter on other, and refuses to do so on puerperal wounds, cannot endeavor to reconcile his action without appearing *inconsistent*.

2. That this method of treatment is the one most reliable, by which fœtid decomposition, and therefore micrococcus poisoning, can be prevented.

3. That the procedure is perfectly safe as regards mercurial poisoning, provided ordinary care is recognized by the physician himself, and that a nurse is never entrusted with the performance of the operation.*

4. That the water be as hot as can be borne, with the view of aiding involution, and that the antiseptic pad should be applied as described.

5. No solution should be used but that of the bichloride.

6. A perfectly new fountain irrigator should be used for each private patient; better none than a second-hand one, no matter how apparently perfect.

* In hospitals trained nurses under a house physician can be relied upon.

7. See that the irrigator is playing before introduction of nozzle, to prevent entrance of air.

8. It is well to remember that one drachm of the salt added to one ounce of spirit, gives for each teaspoonful in one pint of water, 1 part in 1000. From this solution one of any strength can be prepared.

9. In a case where a macerated fœtus has been born, the uterus should be irrigated with a sublimate solution (1–5000) once each day for from three to five days, according to circumstances. A macerated fœtus need not of necessity be in a state of putrid decomposition when expelled, but should it be so, it will be sure to infect the cervix as it passes through. Evidence of infection in such a case may not become manifest until the second, third or fourth day afterwards, when it would be too late to prevent serious damage, or perhaps to save life.

10. Napkins should not be placed against the vulva as a dressing, under any circumstances. The same napkins are often used at successive pregnancies throughout the whole child-bearing life of one woman, and may, for aught we know, have done service for neighbors as well. It is not difficult therefore to see what a serious source of infection they may constitute. A piece of unbleached cotton twenty-four inches long by six inches wide, or better, a similar sized piece of washed gauze, will fix the sublimated jute dressing firmly against the vulva and perineum by being pinned to the binder behind and in front.

11. Lubricants of any kind should not be used; I do not know of any act more unnecessary at obstetric operations. The cervix at this period of pregnancy is at its height of glandular function, and secreting tenacious mucus in large quantities. I have seen a physician deliberately anoint his forceps and hands with stinking rancid lard and introduce them into the uterus. In cases where we have reason to suspect venereal disease of the patient we may use some clean unguent as a protection to the operator, but under no other circumstance.

12. Be sure before leaving your patient that the uterus contains no shreds of membrane adhering to the edge of placental site. I believe a neglect of this precaution is responsible for

many of those cases of sepsis which puzzle us so much to account for, and which has been hitherto placed under the head of auto-infection. I regard the careful introduction of the PURELY ASEPTIC hand into the vagina, and of the fore and middle fingers into the uterus, for exploration after expulsion of the placenta, as a perfectly safe and justifiable procedure. And I am confident that as we gain in experience, we will come to admit on all sides the truth of this teaching. And the procedure will be proved to be much more harmless and rational than the introduction of unwashed fingers within the rima vulvæ of the puerpera for diagnostic purposes.

13. Lacerations of the perineum, even to a slight degree, should be repaired at once by the "single silk suture" method.

14. Never, under any circumstance, allow your sublimate solution to leave your hands, nor prescribe the salt in the form of powder, as recommended by Dr. Garrigues. As a neglect of these precautions, I will briefly relate two instructive cases, both of which show also the enormous doses of the salt which can be taken by mouth with impunity :

A physician prescribed quiniæ sulph. gr. xx to be taken in a spoonful of water ; also hydrg. bichl. gr. vii to be dissolved in a quart of hot water and used as directed. There were several of these latter powders to be compounded and sent to the patient. The nurse, by some stupid error, gave one of the sublimate powders in the spoonful of water instead of the quinine. The patient shortly afterwards became violently ill, and continued vomiting and purging for some time, but eventually recovered without any apparent after ill effects. A notice of this case was published in one of our daily papers at the time, and I took some trouble to obtain a reliable history of the case, which satisfied me regarding its correctness. Shortly after the occurrence of the above case, I had occasion to irrigate a uterus after removing a decomposed decidua in a case of miscarriage. After making the required solution, I put the bottle down on a dark or shaded part of the table, and on leaving the house omitted to take it away with me. Next morning I had a message to say that my patient had taken some poisonous medicine by mis-

take and was dying. I found she had taken a large teaspoonful of the forgotten solution in some water, equal to about eight or ten grains of corrosive sublimate. (It was thought to have been some household remedy for neuralgic toothache.) The dose was taken at 10 o'clock the night previous, fifteen hours prior to my present visit. She had been vomiting nearly all night, and was now suffering most intense abdominal pain and purging violently. Pulse and temperature were, however, undisturbed. There was no history or appearance of collapse, simply an expression indicative of suffering. I at once administered a hypodermic of morphia, applied a sinapism, and after the pain had abated left her. On calling next morning I found her, to my surprise, perfectly well, there being only slight tenderness on pressure over the hypogastrium. *Cavendo Tutus.*